

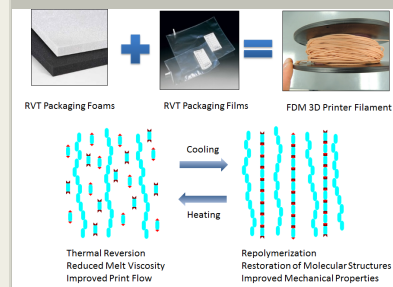
Reversible Copolymer Materials for FDM 3-D Printing of Non-Standard Plastics, Phase II

Completed Technology Project (2016 - 2019)



Project Introduction

Cornerstone Research Group Inc. (CRG) proposes to continue efforts from the 2015 NASA SBIR Phase I topic H14.03 "Reversible Copolymer Materials for FDM 3D Printing of Non-Standard Plastics." CRGs offers NASA the ability to reprocess space mission waste packaging plastics as an In-Situ resource for in space manufacturing via Fused Deposition Modeling (FDM) type 3-D printing of replacement tools, parts, and devices. This innovation is enabling for space exploration, the application of CRG's reversible thermoset (RVT) polymers combined with a plastic recycling, blending, and extrusion process will allow current and future packaging materials to be processed into a copolymer blend filament suited to FDM 3-D printing system. This approach offers two implementation routes including; (1) An RVT additive that can be combined with existing waste packaging during a reclamation process to produce 3-D printer filament and (2) A RVT based replacement packaging material that can be directly reclaimed into 3-D printer filament. The material properties of 3-D printer filament from the RVT-based reclamation process can be tuned for mechanical performance (stiffness, flexibility) by adjusting the blend ratios of reclaimed waste packaging:RVT. This will provide NASA with a means to generate 3-D printer feedstocks with varying mechanical performance from on-hand packaging plastics without the need for separate 3-D printer material payloads. CRG has already demonstrated the efficacy of RVT additive in reclamation of NASA's packaging materials in Phase I by producing a copolymer blend of RVT with NASA packaging, producing a FDM printer filament with the reclaimed packaging, and successfully 3-D printing the resulting reclaimed packaging material. CRG's proposed approach to further develop thermally-reversible polymer materials to reclaim NASA's packaging will provide a material and processing technology readiness level (TRL) of 5 at the conclusion of the Phase II effort.



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Table of Contents

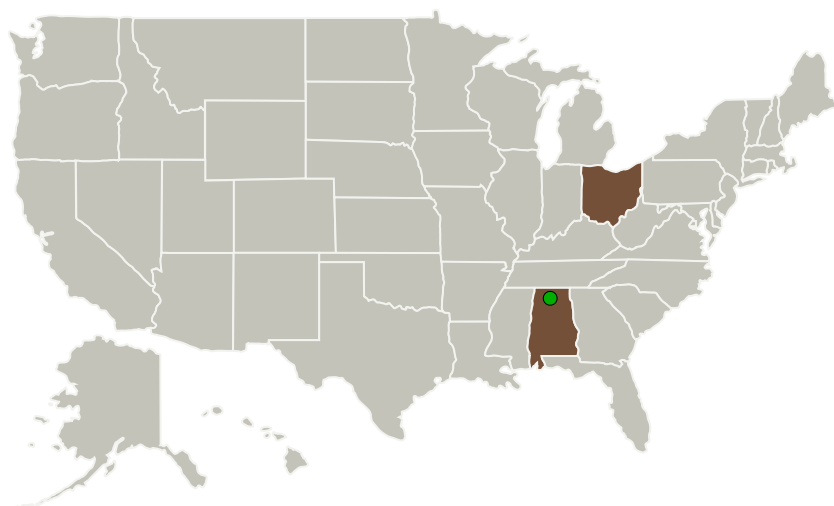
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Ohio

Project Transitions

April 2016: Project Start

August 2019: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141270>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

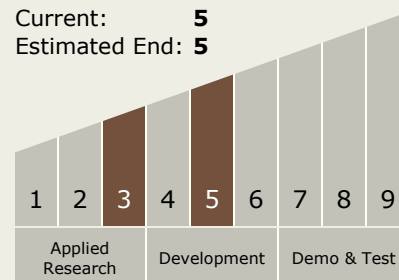
Program Manager:

Carlos Torrez

Principal Investigator:

Brian E Henslee

Technology Maturity (TRL)

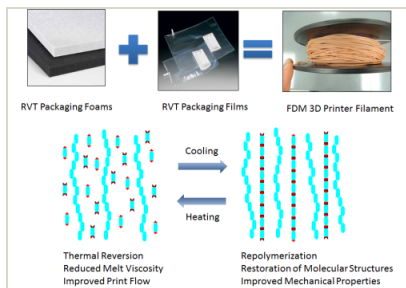
Start: **3**Current: **5**Estimated End: **5**

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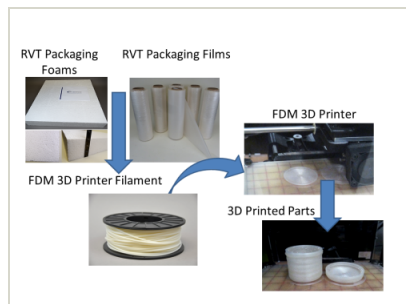


Images



Briefing Chart Image

Reversible Copolymer Materials for FDM 3-D Printing of Non-Standard Plastics, Phase II
(<https://techport.nasa.gov/image/136904>)



Final Summary Chart Image

Reversible Copolymer Materials for FDM 3-D Printing of Non-Standard Plastics, Phase II
(<https://techport.nasa.gov/image/125740>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.4 Sustainable Manufacturing

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System